"The incredible shrinking tumor": Desmoplastic Infantile Ganglioglioma

Keywords: Demoplastic Infantile Ganglioglioma (DIG), malignant features, spontaneous regression


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Objective: Desmoplastic Infantile Ganglioglioma (DIG) is a rare supratentorial tumor of early childhood with malignant features both radiologically and histologically, but a generally good prognosis. We present a case of a newborn in whom spontaneous regression of the lesion was seen without treatment after initial biopsy had suggested high grade malignancy.

Case presentation: A female newborn was referred to our hospital because of macrocrania and raised intracranial pressure. MRI of the brain documented a 10 x 8 x 6 cm left hemispheric partially calcified lesion. Open biopsy, performed on the 11th day after birth, suggested high grade malignancy. Palliative care was administered. Surprisingly, the child did well. Three months after birth MRI showed reduction of the tumor volume. Consecutive scans showed further regression. On the age of fifteen months resection of the residual tumor (two small nodules, 3 x 2 x 2 and 5 x 2 x 1.5 cm) was done. Pathology revealed a DIG.

Discussion: DIGs generally are of voluminous size and partially cystic. Histologically they are characterized by divergent astrocytic and ganglionic differentiation and prominent desmoplastic stroma. More primitive cells with high number of mitoses may be observed. These areas can mimic features of malignant glioma. Surgery is the treatment of choice. Spontaneous regression has been described and is attributed to induction of apoptosis.

Conclusion: Our case illustrates the spectacular spontaneous regression that can be seen in DIG and supports the benign nature of this tumor. Malignant macroscopic, imaging and histological features can be very misleading.
Multiple Dysembryoplastic neuroepithelial tumors of the cerebellum and brainstem. A case illustration

Keywords: Dysembryoplastic Neuroepithelial tumours, posterior fossa

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Dysembryoplastic neuroepithelial tumors (DNETs) are clinicopathologically unique tumors with a mixed glial-neuronal component, characterized by their intracortical location, their multinodular architecture and heterogeneous cellular composition. They are mostly located in the temporal lobe and associated with intractable complex partial seizure in young patients. However, due to the putative origin of DNETs in secondary germinal layers, they can occur in unusual areas of the CNS such as the caudate nucleus, the lateral ventricles and the posterior fossa.

A 27 years old male developed 6 weeks before its admission an acute vertical diplopia due to a right fourth nerve palsy. He had a five years history of vertigo while in neck extension. Magnetic resonance imaging of the brain revealed multiple foci of abnormal signals in the right cerebellar hemisphere, vermis and brainstem. Via a right paramedian supracerebellar and infratentorial approach, the vermian and the quadrigeminal lesions were completely resected. Microscopically, the specimen disclosed fragments of cerebellar cortex and white matter distorted by alignments of small oligodendrocyte-like cells running along bundles of axons and capillaries. They were separated by abundant myxoid material and mature neurons, resuming the characteristic features of the specific glio-neuronal element distinctive of DNETs. MRI performed one year after surgery shows the stability of the remaining lesions. Dysembryoplastic neuroepithelial tumours, although extremely rare must be discussed in the differential diagnosis of multiple cystic lesions located in the posterior fossa. They occur in young patient and behave as benign and stable lesions. The recognition of such rare tumour is needed in order to avoid unnecessary neoadjuvant therapy.

Keywords: angiocentric glioma, neuroepithelial tumor, epilepsy

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Introduction
Angiocentric glioma is a rare epilepsy-related neoplasm with unique clinical, radiologic and pathologic features, that was recently added to the 2007 Revised WHO Classification of Tumours of the Nervous System.

Material and Methods
We present two young patients who underwent complete resection of an angiocentric glioma. Both had a history of complex partial seizures and behavioural disorders. A 12-year-old boy with psychomotoric agitation and irritability presented with a lesion in the right frontal lobe. A 28-year-old female had a borderline personality disorder and a lesion in the right amygdala and anterior hippocampus. One year after surgery, both patients are seizure free (Engel class 1) and show marked improvement of their behavioural disorder.

Discussion
Angiocentric glioma is a new distinct tumor entity, reported in only 26 cases up to now, that typically presents with intractable seizures in children and young adults. These slowly growing tumors have an MRI appearance of T2 and FLAIR hyperintense, non contrast enhancing cortical lesions that may extend to the underlying white matter and show a stalk-like extension to the ventricle.

Histologically, spindle-shaped cells aligned around intracortical vessels (angiocentric) with elongated nuclei can be found. Entrapped immature neurons are present, but it remains unclear whether these are neoplastic. There is no necrosis, vascular proliferation, or increased mitosis and the MIB-1 proliferation index is low (1%-5%)

The most consistent immunohistochemical finding is the GFAP (glial fibrillary acid protein). The neuronal cells may be positive for neurofilament, Neu-N and synaptophysine.

Angiocentric gliomas are listed in the category of "Other Neuroepithelial Tumors" and are considered WHO grade 1.

Conclusion
Angiocentric glioma is a new epilepsy-related neoplasm with good prognosis as to survival and seizure outcome after gross total resection.
Extraventricular, interhemispheric neurocytoma: a rare case

Keywords: extraventricular neurocytoma, central neurocytoma, therapy

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Extraventricular, interhemispheric neurocytoma: a rare case

Introduction:
The central neurocytoma is a rare neoplasm (0.25-0.50% of brain tumors), that is almost always located in the supratentorial ventricles. It was originally described in 1982 by Hassoun et al. The clinical manifestation is usually that of raised intracranial pressure due to hydrocephalus. Focal neurological disturbances may occur in the exceptional case of an extraventricular location.

Immunohistochemistry, ultrastructure and genetic studies are essential to obtain the diagnosis. Safe maximal resection is presently considered the ideal therapeutic option, with best long-term prognosis. Postoperative radiation is reserved for tumors with malignant characteristics or for cases of subtotal resection.

Case presentation:
A 32-year-old right-handed female presented with headache and a right-sided Jacksonian epilepsy. MR-imaging revealed a large, interhemispherical tumoral mass located dorsally of the corpus callosum with central necrosis, a meningeal tail on the midline and accompanied by left hemispheric peritumoral oedema.

Immunohistological analysis identified the tumor as a neurocytoma WHO grade II.

Macroscopic resection was performed by frontal, parafalcine approach without major complications. The tumor which had a hard consistention en was well demarcated from the brain tissue was resected by bipolar coagulation and the Ellman Loop. No motor disturbances were seen postoperatively, but a transient positional sensible deficit of the right hemisoma and transient anxious feelings. No adjuvant radiation therapy was given as postoperative MR imaging showed no residual tumor.

Discussion:
A central neurocytoma is usually found inside the ventricular system; this case is exceptional by the extraventricular, interhemispheric location.

We suppose that this central neurocytoma originates from the subependymal layer of the lateral ventricle.

An interhemispheric parafalcine approach was preferred instead of a transcortical route used for intraventricular tumors.

Conclusion:
This case adds to the growing list of extremely rare sites in which neurocytomas have been found. Although the incidence of these interhemispheric neoplasms is very low, we have to include neurocytomas in the differential diagnosis of intraparenchymal mass lesions.
**Malignant glioma or brain abscess? A diagnostic pitfall in two cases**

**Keywords:** Brain abscess, malignant glioma, 5-ALA, antibiotics

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**Objective:** Although brain abscesses are uncommon in western population, they figure as differential diagnosis for contrast enhancing brain lesions. We present 2 similar cases in which brain abscesses were initially misjudged as malignant glioma.

**Case reports:** In a six months period 2 male adult patients, were admitted to our neurosurgical department with rapidly progressive neurological deficits. In both of them, a large contrast enhancing hemispheric lesion was diagnosed on CT. MRI findings, including diffusion-weighted imaging (DWI), suggested malignant tumours as first differential diagnosis. Corticosteroids favoured partial regression of the symptoms. In one patient antibiotics were administered before operation because of a sepsis.

Based on the suspicion of a malignant glioma, a craniotomy after administration of 5-amino-levulinic acid (5-ALA) was performed. In one patient faint fluorescence was seen but no fluorescence at all was found in the second patient. A brain abscess was documented twice, clinically and on microbial and pathological examination. Antibiotics were continued in one case and started in the other one. Both patients recovered well.

**Discussion:** In both cases there was a high index of suspicion for malignant glioma because of a suggestive appearance on MRI and clinical benefit after administration of corticosteroids. A surgical intervention was inevitable from both clinical and histological point of view. Although no tumour was diagnosed, ALA was slightly positive in one patient, who had already been treated with rifampicine. After drainage of the abscess, full antibiotic treatment favoured a good prognosis in both.

**Conclusion:** Brain abscesses can mimic malignant gliomas. Even if DWI on MRI does not convincingly show an important diffusion restriction, brain abscess should still be considered as differential diagnosis for malignant gliomas.
Recent findings in immunological monitoring for high-grade glioma patients treated with autologous dendritic cell-based tumour vaccination: CD107a expression as effector cell degranulation marker and correlation between CD127dim and Foxp3 expression in CD

Keywords: High-grade glioma; immunotherapy; immunomonitoring

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Introduction. We have successfully treated over a hundred high-grade glioma patients with adjuvant immunotherapy consisting of vaccination with autologous dendritic cells (DC) loaded with autologous tumour lysate. Immune monitoring in these patients is of critical importance as secondary endpoint. The aim of the present pilot study was (i) to validate the use of the recently described cell degranulation marker CD107a (lysosomal associated membrane protein 1) as a functional in vitro assay of both CD8+ T-cell and CD3-CD56+ NK cell cytolytic activity. (ii) On the other hand, we wanted to check the correlation between low expression of CD127 (IL-7 receptor alpha subunit) and expression of Foxp3 on CD4+CD25+ regulatory T cells (Treg) in accordance with recent findings by other groups.

Experimental design. Blood samples of three patients were checked during treatment protocol by flowcytometry at three different time points. (a) Expression of CD107a was checked on CD8+ T-cells and NK cells. Therefore, cells were kept unstimulated or stimulated with autologous tumour cell lysate or mitomycin treated tumour cells. (b) CD127 surface staining and intracellular Foxp3 staining were performed on CD4+CD25+ lymphocytes.

Results. (a) Our preliminary results revealed that CD107a expression was upregulated on CD8+ T cells as well as on CD3-CD56+ NK cells if cells were restimulated in vitro. (b) In all patients two distinct populations of CD4+CD25+ cells could be found: a population of CD127dim expressing CD4+CD25+ cells staining positive for the intracellular Treg marker Foxp3, and on the other hand a population of CD4+CD25+CD127+ cells staining negative for Foxp3.

Conclusion. We have shown that (i) CD107a can be used as a functional degranulation marker for both CD8+ T-cells and NK cells in immune monitoring of high-grade glioma patients vaccinated with autologous DC. (ii) CD127dim expression can be used as selection marker of human CD4+CD25+ Treg cells.
Facial Nerve #Geniculate Ganglion schwannoma

Keywords: Facial Nerve schwannoma, Bell's palsy

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Introduction: Schwannomas of the facial nerve (FN) presenting facial Bell's palsy are rare. Since Schmidt (1930) 500 cases of FN schwannomas are reported on which only 5% presenting Bell's palsy as a major symptom. Nearly 43.5% of FN schwannomas are located labyrinthine or at the geniculate ganglion (GG).

Method: We report one patient presenting hemifacial motor weakness as a major symptom which was treated as a classical Bell's palsy without a normal ct-scan and only emg dysfunction (CMAP)-changes. Because of clinical and emg deterioration after six months, MRI was performed and demonstrated a tumor mass located at the GG.

Dilemma and treatment discussion on FN schwannomas versus surgery because the best postoperative prognosis is no better than House Brackmann grade III.

Treatment options of FN schwannomas: if no facial palsy the best treatment option is to wait for surgery and follow the clinical situation because palsy is inevitable after surgery.

The strategy of surgery of FN schwannomas depends on the site of main tumor mass extension along the FN and involvement of the auditory organs.

Result: The patient we present got surgery with a total removal of the schwannoma of the GG and preservation of the FN (monitoring during surgery) by an extradural middle fossa approach. Because of no recovery of the FN motor dysfunction and persisting Bell's palsy twelve months after surgery and normal MRI, we performed a jump anastomosis end to side with greater auricular nerve graft between NXII to FN. Patient got a very nice recovery of FN function to House Brackmann gr. II.

Conclusion: Bell's palsy is a less common symptom of FN schwannoma and has to be kept in mind. Treatment options and timing of surgery are controversial: conservative versus surgery. There is always a dilemma if no dysfunction of FN because palsy is inevitable after surgery, but in case of progressive Bell's palsy as a symptom of FN schwannoma, surgery is the best option knowing that the best operative prognosis is no better than House Brackmann grade III.
Malignant transformation of a vestibular schwannoma after radiosurgery

Keywords: vestibular schwannoma, malignant transformation, radiosurgery

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Abstract
The occurrence of malignant nerve-sheath tumors is unusual in patients without neurofibromatosis and is rarely intracranial.
We report the malignant transformation of a vestibular schwannoma, 8 years after radiosurgery was applied to the remnant of the tumor after primary resection.

Content
A 53-year-old woman presented with dizziness and vertigo on physical examination. There were no stigmata of neurofibromatosis. Medical records showed a 5 year-history of right sided hearing loss due to a cholesteatoma, for which she underwent mastoid surgery.
MRI showed a 6 cm mass in the right cerebellopontine angle. We resected the tumor partially through translabyrinthic approach. Histological examination of the tumor showed a schwannoma with no sign of atypia. Subsequently radiosurgery was performed 3 months later to prevent re-growth of the residual tumor (12Gy). Serial MRI remains stable for 2 years, after which an MRI revealed a tumor expansion up to 4cm diameter. The patient refused a second surgery. Imaging performed during the follow-up period revealed no further tumor progression.
However, 8 years after radiosurgery, the patient was referred to us in deep coma and died the day of admission. The postmortem findings outlined a dense cellular mass with atypical cells, a pronounced polymorphism and mitotic activity, which was interpreted as malignant schwannoma and classified as radiation-associated second tumor. [Cahan 1948]

Conclusion
Long-term effects of stereotactic radiosurgery of benign intracranial tumors are not yet fully understood. Continual surveillance of the patients remains necessary and cautious application of radiosurgery of benign tumors is recommended.
Melanocytoma of the central nervous system: Presentation of 3 cases

Keywords: melanocytoma

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Objective:
To present 3 patients with the rare diagnosis of melanocytoma.

Material and methods:
Patient 1 developed a Brown Sequard syndrome. MRI of the cervical spine showed an intradural tumor at the craniocervical junction up to the level of C2 with involvement of the spinal cord. A macroscopic total resection was performed of the partially intramedullary tumor.

Patient 2 presented with severe cervical pain and paresis of the left arm. MRI of the cervical spine demonstrated an intradural extramedullary midline tumor of the craniocervical junction with compression of the medulla. A complete resection of the tumor with invasion of the medulla was achieved through a far lateral approach.

Patient 3 was diagnosed with a left occipital intraventricular tumor after a seizure with visual hallucinations. Patient underwent macroscopic total resection.

Results:
Intraoperatively the tumors were completely or partially pigmented. There were strong adherences with or even invasion in surrounding tissue. Microscopic examination revealed typical melanocytes with low mitotic index. The first patient presented a local recurrence after 12 months and possible small droplet metastasis in the cerebellum. He was treated with fractionated radiotherapy with stable follow-up. Longest follow-up is 36 months.

Conclusions:
We present 3 rare cases of melanocytoma of the central nervous system. Radical surgery should be the first treatment option. In literature the prognosis of these tumors is unclear. Close follow-up after resection is mandatory. The effect of adjuvant radiotherapy is to be evaluated.
The effects of electrical stimulation or an electrolytic lesion in the mediodorsal thalamus of the rat on survival, body weight, food intake and running activity in the activity-based anorexia model.

Keywords: Anorexia nervosa, activity-based anorexia, electrical stimulation, electrolytic lesion, mediodorsal thalamus


Introduction:
Neuromodulation may be a new treatment for patients with treatment-refractory anorexia nervosa. In a blinded randomised controlled study, we examined the effect of high-frequency electrical stimulation (ES) and an electrolytic lesion (LES) in the mediodorsal thalamic nucleus (MD) in the activity-based anorexia (ABA) rat model. In a preceding study, MD glucose metabolism was increased in rats in this validated model for anorexia nervosa. ES in hyperactive brain regions has previously been proven successful in e.g. major depressive disorder and cluster headache.

Methods:
The present study compared five groups to evaluate the effect of ES and LES on survival, body weight, food intake and running activity in the ABA model, which is induced in rats by restricting the feeding period to 1.5h daily in the presence of a running wheel. All groups, except one, were introduced in the ABA model. The first group was stimulated in the MD (n = 6), the second one was not stimulated (n = 10), the third one was stimulated in the MD, but not introduced in the ABA model (n = 6), the fourth one was stimulated in a random nucleus (n = 6) and the fifth group received a lesion in the MD (n = 9).

Results:
Electrical MD stimulation did not improve the symptoms of rats in the ABA model, in comparison with all other groups. There was a trend towards a positive effect on survival when comparing the MD-lesioned rats to the non-stimulated rats (log-rank, p = 0.055), but there was no significant improvement of all other parameters.

Conclusion:
The MD might not be the most suitable target for neuromodulation to treat anorexia nervosa, although the neuroimaging study pointed in that direction.
FAST-GROWING BRAIN METASTASIS OF SYNOVIAL SARCOMA SUCCESSFULLY TREATED BY GAMMA KNIFE RADIOSURGERY: CASE REPORT.

Keywords: synovial sarcoma, brain metastasis, gamma knife radiosurgery

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Introduction: Synovial sarcomas are rare malignant tumors that account for less than 1% of all malignancies in adults; brain metastases of these soft-tissue malignant tumors have been exceptionally reported in the literature. We report a very rare case of brain metastasis from a synovial sarcoma of the iliac crest, which has grown exceptionally fast after surgical removal and which has been controlled by Gamma Knife (GK) radiosurgery.

Materials & Methods: A 36-year-old woman with a history of synovial sarcoma from the left iliac crest removed in 1994 and multiple pulmonary metastases since 1996, was operated for a left ponto-cerebellar metastasis of 28x32x36 mm. The post-operative MRI confirmed complete removal of the metastasis. A new MRI performed 1 month later showed a fast-growing recurrence of the metastasis in the ponto-cerebellar angle that was measured at 31.8x15.8x27 mm. The recurrent metastasis was treated by GK radiosurgery; a margin dose of 20 Gy was prescribed at the 50% isodose on a tumor volume of 7425 mm³.

Results: The patient remained asymptomatic during follow-up. A cerebral MRI was performed every month in the following 6 months, and 3D slices of all these imaging were correlated with the MR acquisition performed during the GK procedure using the software GammaPlan Multiview®. The tumor volume reduced and central necrosis inside the metastasis appeared in the MR examinations performed during follow-up.

Conclusions: GK radiosurgery can be a successful treatment of brain metastasis of soft-tissue malignant tumors such as synovial sarcomas. Very fast-growing brain metastases could be efficiently controlled by GK treatment. Robotic systems allowing radiosurgery treatment in the body could potentially be a treatment option for metastases of synovial sarcomas located outside the brain.
Introduction: The role of dose heterogeneity in radiosurgery remains controversial. While most Linac-based radiosurgical treatments provide a highly homogeneous radiation dose inside the target volume, Gamma Knife (GK) radiosurgery provides a high heterogeneity inside the target volume because the 50% isodose is the most often prescription isodose used. We analyzed histological effects of dose heterogeneity inside the target volume in an animal model of GK irradiation and the clinical application of the effects of dose heterogeneity in GK radiosurgery.

Materials & Methods: We irradiated by GK a fixed target volume inside the right striatum of 16 rats using increasing margin doses and 12 rats using a fixed margin dose and increasing dose heterogeneity inside the same target volume. Histological response was assessed 3 months after irradiation.

The role of dose heterogeneity in patients' clinical outcome was analyzed in a clinical series of 82 patients treated by GK for a vestibular schwannoma (VS). The margin dose was similar for all patients. Evolution of the audiological function after GK was compared to the hot spot of dose delivered inside the intracanalicular part of the tumor.

Results: Six of the 9 histopathological reactions of GK radiosurgery were related to the radiation dose used. However, using a fixed radiation dose, increasing dose heterogeneity significantly increases 7 of the 9 histopathological effects of GK inside the target volume. A higher dose hot spot inside the target volume significantly worsen the audiological outcome in the clinical VS series.

Conclusions: Dose heterogeneity inside the target volume significantly influences histological effects of radiosurgery and can modify the clinical outcome. A better clinical outcome in radiosurgery could be reached by improving the dose distribution inside the target volume.
Radiological progression of a cerebral metastasis treated radiosurgically with a negative anatomopathology after resection. Two rare cases.

Keywords: Brain metastasis, radiosurgery, radionecrosis

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Introduction:
Choosing for radiosurgery versus surgery in the treatment of a single brain metastasis depends on its size, location and sometimes on patients general condition. Due to evolution in therapeutical options and neurosurgical techniques, most cases die from other reasons than CNS metastasis. Having both powerfull tools in our institution, we are in a comfortable position to switch or combine treatment modalities, certainly in rare cases of failure in achieving local tumour control.

Case report:
We report two radiosurgically (20Gy) treated patients with a solitary metastatic brain disease, showing evident tumour progression on MRI and CT with clear marginal contrast enhancement, in the absent of neurological worsening. Neuronavigation guided microsurgical resection has been performed in both cases. During intervention, no clear surgical margins could be determined. Anatomopathology reveals twice fibronoid necrosis without any viable tumoural tissue surrounded with normal cerebral tissue and gliosis.

Conclusion:
We can conclude that not all radiological tumour growth after radiosurgery for metastasis, how suggestive it may be for a progressive disease, should be considered as one. The necessity for microsurgery in those cases should be evaluated in correlation with neurological signs and noninvasive assessment techniques as PET and SPECT in comparison with MRI and CT.
The use of a novel side-outlet curved test electrode in deep brain stimulation (DBS)

Keywords: DBS, macrostimulation electrode, side curved electrode

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Rationale
Peroperative macrostimulation in DBS for movement disorders is the standard method to assess the clinical response and determine the location of the definite quadripolar electrode. On the basis of targeting by cartesian coordinates from midcommissural point and direct target nucleus visualisation, about 65-75 % of calculated trajectories seem to be satisfactory. If the response is unsatisfactory, new trajectories are necessary for repeat clinical testing and to determine a preferable site.

The method of micro-electrode recordings has been designed to identify the physiological anatomical site of the preferred target. With this method up to 5 trajectories, are made to identify the best location on the basis of the physiological and clinical response.

To reduce the number of trajectories and therefore the risk of adverse events, we have designed a novel tip side-outlet curved test-electrode, which has been manufactured by Inomed. At 5 mm of the electrode tip, there is a side opening, through which a curved electrode can pass. Either the tip of the straight electrode or the tip of the curved electrode may be used for macrostimulation. This electrode allows us to test an indefinite number of locations within a virtual cylinder with a radius of 4 mm. All possible stimulation sites are well within the range of the targets currently used in movement disorders such as the VIM of the thalamus, medial globus pallidus and subthalamic nucleus.

Results
We first used the side-electrode in sept 2007 in ten trajectories; it reveals to be very easy in use, allowing testing of direct clinical effect, optimal positioning of definitive electrode in a safe and efficient way.

Future
A new microdrive is designed, allowing, if necessary, to perform the definitive trajectory, in a parallel way and without repositioning the frame.

In conclusion, the side-bended test electrode allows us to test the entire range of the target with only one trajectory for the test electrode and, if necessary, only one extra trajectory for the placement of the definite electrode.
Introduction:
Image guided neurosurgery has become the gold standard for interventions in and on the brain. Recently also functional imaging has become incorporated in neurosurgical clinical practice: fMRI with or without DTI or PET/CT/MRI are increasingly used to define either targets or areas to be preserved in neurosurgical operations. Both fMRI and PET have one major drawback for functional neurosurgery as both functional imaging techniques present evoked (=phase locked) or induced (=not phase locked) activity, i.e. no spontaneous activity. EEG on the other hand, which can measure evoked but also spontaneous activity, has a high temporal, but low spatial resolution. The major drawback for EEG navigation was the difficulty to localize the sources or generators of the recorded electrical brain activity in a 3D-brain space. Recent developments for source localization alleviate this problem, but the low spatial resolution remains.

Therefore combining multiple functional imaging techniques with source localized EEG and even source localized iEEG (=intracranial EEG, recordings from implanted electrodes) can be a first step in assessing the validity of potential future EEG-based neuronavigated interventions.

Material and methods:
Two patients with phantom perceptions underwent a fMRI, CT, EEG and iEEG, Using CURY software the structural images, functional images, EEG and iEEG are fused.

Results:
The fused images demonstrate the spatial accuracy of the spontaneous electrical activity on source localized-EEG in relation to the intracranial recordings, as well as its relation to the structural and functional images.

Conclusion:
Even though technically challenging, this multimodal imaging technique allows to foresee a future where neurosurgeons will be able to define targets for modulating neurological, psychiatric and psychological diseases, not solely based on evoked or induced functional imaging but also on spontaneous activity.
**Congenital Cranial Dermal Sinus Unveiled by Recurrent Meningitis**

**Keywords:** Dermal sinus, meninges

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Congenital dermal sinuses (CDS) are rare malformations characterized by incomplete obliteration of the dermal elements during closure of the neural tube in the developing foetus. CDS extend from the skin surface to varying levels of subcutaneous tissues and sometimes intradurally with involvement of neural elements. Most documented cases were described in paediatric population, and are commonly localized at the posterior fossa and lumbo-sacral regions. This report presents a rare case of cranial CDS unveiled by recurrent episodes of meningitis in an adult case.

A 54-year-old woman was admitted for progressive gait disturbance and health status deterioration. Medical history revealed that she had undergone 6 months before admission a ventriculoperitoneal shunting procedure for a hydrocephalus secondary to intraventricular arachnoid cyst. A shunt infection (Epidermidis Multiresistant Staphylococcus) was identified that necessitated the shunt externalisation and the induction of antibiotherapy. Later on, she presented five recurrent episodes of meningitis. The first and the fourth were due to a multiresistant E. coli. No source of infection was identified, except a small circumscribed cutaneous lesion of the scalp that was masked hairs and localised in the left parietal parasagittal region. A CT-scan depicted a linear bone defect close to this lesion. We resected totally the lesion and its communication through the bone with the superior longitudinal sinus. The histopathological examination revealed a primary or secondary cutaneous fibrotic lesion of the dermal and hypodermal tissue. This lesion was epithelised with meningo-endothelial cells and contained inflammatory cells. During the 6th episode of meningitis, the patient developed two deep-seated brain abscesses resulted in a spastic tetraparesis. The patient is still showing a favourable clinico-radiological evolution two months postoperatively.

This case report underscores the importance of the clinical meticulous investigation in adult patients presenting recurrent episodes of meningitis and without evidence of infection focus. CDS might be considered as potential source of infection in those particular patients.
Delayed angiomatous degeneration in a case of mesial temporal lobe epilepsy treated radiosurgically

Keywords: Tumour, Epilepsy, Mesial, Temporal, Radiosurgery, Gamma Knife

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Mesial temporal lobe epilepsy (MTLE) is one of the most common cause of intractable partial epilepsy. The conventional treatment of patients with MTLE is surgical excision. Currently, the interest of radiosurgery is being explored as an alternative treatment. We report the first delayed major complication related to this treatment.

A 54-year-old woman was treated in April 2001 by Gamma Knife for a refractory MTLE. Her right temporomesial area received a dose of 20 Gy at the 50% marginal isodose line for an medical intractable right MTLE. The patient always presents seizures but one shorter duration and with important reduction of the frequency of the seizures. She presented in our department on November 8th, 2007 and showed an intracranial hypertensive syndrome related to an expansive hemorrhagic lesion of the right mesio-temporal area. A papillar edema was demonstrated. We contacted the radiosurgical group which recommended a treatment by 64mg of methylprednisolone per day. On November 13th, as she still complained about headaches we scheduled a surgery. However, she came back a few days later in emergency with a temporal herniation syndrome requiring an urgent surgical procedure. The expansive lesion was macroscopically removed and the patient recovered well. Histological examination revealed reactional gliosis, deterioration of the white matter, hemorrhagic lesions and vascular lesions of two orders: hyalinized vessels and a parenchyma presenting an angiomatous aspect.

Although reports on radiosurgical treatment of MTLE are encouraging, this case stresses the risk of developing many years later an angiomatous degeneration of the targeted brain with severe intracranial hypertension.
Burst stimulation of the auditory cortex for narrow band tinnitus

Keywords: Tinnitus, Burst stimulation

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INTRODUCTION: Tinnitus is an auditory phantom percept related to tonic and burst hyperactivity of the auditory system. Two parallel pathways supply auditory information to the cerebral cortex: the tonotopically organised lemniscal system, and the non-tonotopic extralemniscal system, firing in tonic mode and burst mode respectively. Electrical cortex stimulation is a method capable of modulating activity of the human cortex, by delivering stimuli in a tonic or burst way. Burst firing is shown to be more powerful in activating the cerebral cortex than tonic firing and bursts may activate neurons that are not activated by tonic firing.

METHODS: Five patients with an implanted electrode on the auditory cortex were asked to rate their tinnitus distress and intensity on a Visual Analogue Scale before and after both tonic and burst stimulation. All patients presented both pure tone and narrow band noise tinnitus.

RESULTS: Results show a significant better suppression for narrow band noise tinnitus with burst stimulation in comparison to tonic stimulation, Z=2.02, p=.043. For pure tone tinnitus no difference is found between burst or tonic stimulation, Z=0, ns.

DISCUSSION: Based on the hypothesis that narrow band/white noise is the result of hyperactivity in the non-tonotopic system, we suggest that burst stimulation modulates the extralemniscal system and lemniscal system and tonic stimulation only the lemniscal system.
Qualitative and quantitative assessment of cervical disc degeneration

Keywords: Disc degeneration, Scoring system, Spine, Cervical

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Introduction: Degeneration of the intervertebral disc is one of the most frequently encountered spinal disorders. In order to describe and quantify disc degeneration and to evaluate a possible relationship between degeneration and biomechanical parameters, e.g. the intervertebral range of motion and intradiscal pressure, a scoring system for disc degeneration is mandatory. However, few scoring systems for the assessment of cervical intervertebral disc degeneration exist. Up to date, only 2 of those systems have been tested for inter- and intra-rater reliability. The goal of this study is to develop and validate a new objective scoring system to qualitatively and quantitatively assess the degree of cervical disc degeneration.

Methods: The scoring system consists of three variables which are individually scored on neutral lateral radiographs: "Height loss" (0-4 points), "Anterior osteophytes" (0-3 points) and "Endplate sclerosis" (0-2 points). Each variable contributes to the total degeneration score (max. 9 points).

The degeneration of 20 discs of 20 patients was blindly assessed by 4 raters: 2 surgeons (1 senior and 1 junior) and 2 radiologists (1 senior and 1 junior), firstly based on clinical experience (CE) and secondly using the scoring system.

Measurement errors (ME) were estimated using within-subject standard deviations. Inter- and intra-rater agreement was determined using a two-way random model of intraclass correlation coefficients (ICC), with measures of absolute agreement.

Results: The ME of the scoring system was 11.1% versus 17.9% of the CE results. The scoring system showed excellent intra-rater agreement (ICC=0.86, 0.75-0.93) and excellent inter-rater agreement (ICC=0.78, 0.64-0.88). The latter is an improvement with respect to the CE results (ICC=0.77, 0.59-0.89). Surgeons as well as radiologists and seniors as well as juniors obtained excellent inter- and intra-rater agreement.

Conclusions: The proposed scoring system can be a reliable and objective tool for assessing cervical disc degeneration based on lateral radiographs. Moreover, the scoring system showed to be experience- and discipline-independent.
Recruitment of Preserved Spinal Cord Parenchyma after Spinal Cord Injury in Order to Increase Locomotor Recovery

Keywords: Rat, Spinal Cord Injury, Locomotor Central Pattern Generator, Repetitive Transcranial Magnetic Stimulation, Body Weight Supported Treadmill Training, Pharmacotherapy

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Paraplegia and tetraplegia after spinal cord injury are mainly due to the disconnection of sublesional spinal cord from the supraspinal centres. In the clinical setting, most of the spinal cord injuries are located in the cervical and thoracic cord. In these cases, the lumbar locomotor centres are isolated by the interruption of the long spinal white matter tracts.

A research movement has increasingly investigated spinal cord injury over the last three decades, and has mainly focussed on repair attempts in order to restore lost connections. Functionally significant experimental results of this strategy remain sparse.

However, in the great majority of cases, the interruption of the spinal cord white matter tracts is not anatomically complete and the lumbar locomotor central pattern generator (CPG) is anatomically preserved. Therefore, our work has addressed possibilities to recruit the neuronal circuitry of the deafferented CPG in order to increase locomotor function.

We first describe the fundamental principles which underlie this therapeutic approach, the experimental evidence for its effectiveness as well as recent clinical data encouraging the use of these treatment strategies. We then present an experimental investigation of incomplete spinal cord injury in the rat. Body weight supported treadmill training was used in order to recruit the CPG via the proprioceptive peripheral afferents. Repetitive transcranial magnetic stimulation (rTMS) was investigated for its potential to recruit remaining descending white matter tracts. Looking for synergic treatments, rTMS was combined with treadmill training and monoaminergic pharmacotherapy (since the locomotor activity of the CPG is modulated by monoamines).

The results of these studies indicate that this therapeutic approach, rapidly applicable in the human, may significantly increase locomotor recovery and modify existing rehabilitation strategies. However, limitations of the partial spinal cord injury model are also revealed, indicating the need for further, methodologically sound studies in this field of neurosurgical research.
Preliminary observations after discectomy plus fusion with the use of bioresorbable cages

Keywords: Bioresorbable cervical cages

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While debate is still open on surgical techniques that might be employed following cervical discectomy, we propose our preliminary and retrospective observations related to the use of bioresorbable cages crimped with autologous bone graft in terms of tolerance, fusion, and mechanical or clinical complications.

From December 2003 to January 2008, 31 patients (11 men and 20 women) from 28 to 80 years old underwent cervical discectomy followed by the implantation of polylactide cages (Altus © or Solis-R ©) for radicular (23), medullar (7) or both (1) symptoms. Involved levels were C3/C4 (14 %), C5/C6 (49 %) and C6/C7 (38 %). Mean follow-up was 9 months.

There were no major complications. Relief of radicular symptoms was considered as excellent. Imaging examinations revealed no artifacts, neither surrounding osteolysis processes, implant migration or fracture. Fusion signs were seen after five weeks and no pseudarthrosis occurs.

Our first observations suggest that bioresorbable polylactide cages are safe and reliable for cervical intersomatic fusion. Moreover, their initial benefits appear to be comparable with our experience on persistent devices, thus providing a new tool in surgeon#s options. Extensive studies on larger groups through longer assessment periods would therefore be useful in order to reach statistical significance.
Is there a need for navigation guided disc replacement?

Keywords: navigation, disc prosthesis

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Introduction
Total lumbar disc replacement (TLDR) has become a rapidly growing technology in treating degenerative disc disease (DDD). The malpositioning of the prosthesis can be one of complications which is surgeon related. Recently, it has been shown that navigation system may assist the surgeon in conforming precise positioning during the procedure. It would provide superior imaging data compared with conventional intraoperative imaging technology in spine surgery.

Study Design
The authors performed a prospective study involving randomized radiological assessment for confirming the coronal midline positioning in lumbar arthroplasty, and try to provide the most precise guidance.

Purpose:
The aim of the study is to check the accuracy of the placement of the prosthesis during surgery, and to check if accuracy and precision of the placement intraoperatively could be improved by navigation and thus enhance the safety of the procedure.

Materials and Method:
Total lumbar disc replacement with Prodisc® L prosthesis was performed by anterior retroperitoneal approach at all cases with single level. Two image guide techniques were used on 20 patients: 10 cases were operated with navigation and 10 cases with standard fluoroscopy guidance. Midline positioning is performed either with the navigation pointer (Fig. 1), either with radiological assessment of a needle on the supposed midline. Postoperatively the prosthesis midline was assessed with computed tomography and conventional radiography. The interpedicular line was drawn on the axial plane image; the midpoint of this line was considered as reference midline. The line through the keel of the prosthesis should be perpendicular to the interpedicular line. The actual midline positioning of each patient was defined as the offset distance of the prosthesis keel from the interpedicular midpoint, and perpendicular to the interpedicular line.

Results:
In midline positioning of prosthesis, similar results were found between the two groups. Mean deviation from the midline in both groups was similar (1.3mm with conventional fluoroscopy, 1.5 with navigation). With navigation there was a considerable prolongation of the operating time (mean of 113 minutes with navigation, mean of 83 minutes with fluoroscopy). No adverse effects were noted in either group.

Conclusions:
Navigation assisted midline marking has in our opinion an important advantage for the surgeon during the learning curve of spine arthroplasty surgery. More experienced surgeons will find no significant advantage with navigation.
Non-traumatic Non-rheumatic Atlantoaxial Instability in Two Twin Sisters: A case study.

Keywords: Atlantoaxial instability, atlantoaxial dislocation, C1-C2 fixation

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Non-traumatic Non-rheumatic Atlantoaxial Instability in Two Twin Sisters: A case study.
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Objective: Atlantoaxial instability can occur as a result of trauma with disruption of the transverse and alar ligaments with or without fractures and is a potential life-threatening situation. Non-traumatic causes of atlantoaxial instability, such as inflammatory, tumoral or congenital conditions, can result in progressive degeneration of the C1-C2 joints and narrowing of the anteroposterior diameter of the spinal canal with compression of the spinal cord. We report two 70-year old homozygote twin sisters with non-inflammatory, non-syndromic, non-traumatic atlantoaxial instability.

Case report: Two twin sisters both suffered from progressive cervicalgia and paraesthesias in the upper extremities. In one sister symptoms started at the age of 62, while in the other patient symptoms started at the age of 69 after a fall. Both had mild myelopathic signs on clinical examination. They were both diagnosed with reducible atlantoaxial instability with secondary compression of the spinal cord and T2 hyperintensity on MRI. On computed tomography significant disc and uncarthrosis were present in both cases. No significant medical history was reported, nor were there any signs of a syndromic origin. An os odontoideum was not present and occiput and posterior arch of the atlas were well developed. Testing for infectious, tumoral and/or auto-immunological origin was negative. Reduction and C1-C2 fixation were performed in the first patient. In the other patient a C1 laminectomy was performed followed by occipitocervical fusion and fixation. No complications were reported. Symptoms improved substantially in both sisters.

Discussion: Non-traumatic instability is a rare condition, usually secondary to rheumatic conditions. Although no congenital syndrome appears to be present in our two cases, it is striking that this rare condition appeared in homozygote twins, suggesting a genetic factor. The symptoms of myelopathy only appeared in their sixties, suggesting a role for degeneration. To the best of our knowledge, this has never been reported before.
Spinal surgery in Belgium 2000 - 2005: an analysis based on RIZIV-INAMI data

Keywords: Spinal surgery

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Background
For most neurosurgeons in Belgium, spinal surgery is an important part of their activity. During the last decades, the scope of neurosurgical spinal operations has broadened from decompressive procedures to complex anterior and posterior fusion procedures and some have really subspecialized in spinal surgery. Nevertheless, few spinal publications have emerged from the neurosurgical society and Neurosurgeons don’t play important roles in discussions with health policy stakeholders.

Methods
Based on nomenclature numbers we analysed the number of operations performed yearly during 6 years and compared the numbers performed by different specialists. A major limitation in this study is that the reported nomenclature probably not always reflects the exact kind of operation (e.g. decompressive versus fusion).

Results
The yearly number of lumbar spinal operations for degenerative disease has increased nearly twofold over a 6 year period to more than 13000. The vast majority of (lumbar) decompressive surgery is performed by neurosurgeons. Posterior fusion procedures are nearly equally divided between neurosurgeons and orthopedic surgeons as well as anterior fusion procedures. As could be expected, cervical operations are mainly done by neurosurgeons. Orthopedic surgeons have a monopoly for scoliosis surgery. From the RIZIV-INAMI data it is difficult to have correct ideas about the kind of operations performed because of old nomenclature numbers.

Conclusion
A majority of spinal operations is done by neurosurgeons. Neurosurgeons should play an equally important role in scientific spinal meetings, and should make an effort to publish and make contributions to the scientific basis of spinal operations.
Long-segment stabilization of unstable osteoporotic fractures in the elderly

Keywords: spinal fractures, osteoporosis

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Background
Osteoporotic fractures are very common in the older population and only a minority of them is unstable. These fractures are treated by geriatrists or general practitioners and unstable fractures are mostly not recognized.

Methods
We retrospectively reviewed 13 surgically treated patients with osteoporotic unstable thoracolumbar fractures between 2001 and 2007 in order to review the surgical indications, morbidity and postoperative result on normal follow-up. All patients underwent long-segment stabilization with pedicle screws, often with cement augmentation.

Results
The mean age was 76 years. The mean interval between fracture and surgery was 4.4 months. 6 patients were bedridden because of intractable pain, some of them several weeks or months. Some patients had lost a lot of weight. 4 had a progressive neurological deficit. There was no mortality or worsening of neurological status. Only in one of four cases there was an improvement in neurological function. 11 patients experienced an important gain in quality of life and sometimes spectacular improvement of pain, although several were not pain free at the last follow-up, partially due to other (stable) compression fractures. One patient developed pneumonia which could be cured. Two patients had difficult wound healing, one of them needing prolonged antibiotic therapy. Screw misplacement was more frequent in cement-augmented trajectories. The mean follow-up was 7 months. No late screw displacement was noticed.

Conclusion
Unstable fractures in the elderly, that cannot be treated with simple vertebroplasty or kyphoplasty, have to be considered for long segment posterior pedicle screw fixation, combined with cement augmentation. Anterior reconstruction with cages seems not to be necessary. A population study in geriatric services could be useful to have an idea about the epidemiology and mortality of these kind of fractures. Collaboration with a surgical department seems mandatory for geriatrists in order to recognize and treat #dangerous# fractures in an early stage.
STERILE SURGICAL TECHNIQUE FOR SHUNT PLACEMENT REDUCES THE SHUNT INFECTION RATE IN CHILDREN: PRELIMINARY ANALYSIS OF A PROSPECTIVE PROTOCOL IN 115 CONSECUTIVE PROCEDURES

Keywords: Hydrocephalus, VP shunt, Pediatric, Infection

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Introduction. To evaluate whether the rigid application of a sterile protocol for shunt placement was routinely applicable and reduced shunt infections (SI) in children (Childs Nerv Syst. 2007;23:1251-61).

Materials and methods. Since 2001, a rigid sterile protocol for shunt placement in children using neither antibiotic-impregnated catheters nor laminar airflow was prospectively applied at Erasme Hospital, Brussels, Belgium. For assessing protocol efficacy, we analyzed the first 100 operated children (115 consecutive shunt placement/revision procedures). All procedures were performed by the same senior surgeon, one assistant, one circulating nurse, one anesthesiologist. The sterile protocol was rigidly imposed to these 4 staff members: uniformed surgical technique; limited implant and skin edge manipulation; minimized staff circulation; scheduling surgery as first morning operation; avoiding postoperative CSF leak; double gloving; procedures of less than 30 minutes duration; systemic antibiotics prophylaxis. We analyzed separately: 1) children with preoperative increased SI risk (n=38); 2) children aged <12 months; 3) shunt revision procedures.

Results. Protocol violations were recorded in 71/115 procedures (mainly done by non-surgical staff), decreased with time and were medically justified in some young children. No SI occurred (follow-up: 4 to 70 months). One child developed appendicitis with peritonitis (streptococcus faecalis) after 6 months. No SI was found. After peritonitis was cured, shunt reinsertion was uneventful.

Conclusion. These preliminary results suggest that drastic sterile surgical technique for shunt placement: 1) can be rigidly applied on routine basis; 2) can lower early SI rate below 1%; 3) might have a stronger impact to reduce SI than using antibiotic-impregnated catheters and optimizing the operative environment.
**Split cord malformation type I (diastematomyelia): illustration of surgical technique**

**Keywords:** split cord malformation, diastematomyelia, tethered cord, occult spinal dysraphism

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**Introduction**
A split cord malformation is a form of occult spinal dysraphism caused by an accessory persistent neurenteric canal. Two types are classically described. In type I, previously diastematomyelia, two hemicords, each contained within their own dural tube, are separated by a dura-sheated rigid osteocartilaginous septum. In type II, previously diplomyelia, two hemicords housed in a single dural tube, are separated by a nonrigid, fibrous median septum. Since almost all patient will develop progressive neurological deficits, early surgical intervention is advocated, even in asymptomatic children. We report on a case of type I split cord malformation and illustrate the surgical technique.

**Material and Methods**
A 6-month-old girl presented with lumbar cutaneous stigmata (hypertrichosis and capillary hemangiomas) but without neurological abnormalities. MRI revealed a type I split cord malformation at L3 level. Cranially to the medullary duplication a syringohydromyelia was noted. At L2 and L3 spina bifida was present and below the lumbosacral laminae were absent. After exposition of the proximal and distal dura and resection of superficial part of the bony spur, the dural cleft could be visualised. The dura mater was opened distally and the conus and filum terminale were visualised. After complete extradural resection of the bony spur down to the posterior vertebral wall, the dural cleft was excised in an elliptic fashion.

**Discussion**
It is necessary to resect the complete dural cuff, to prevent regeneration of the bony spur, while the anterior dural defect can be left open. Before closure of the posterior dura, the filum terminale was cut, since this can be a second cause of tethering, and the proximal syringohydromyelia was fenestrated. The postoperative course was uneventful.

**Conclusion**
Surgery for a type I split cord malformation with complete resection of the bony spur and dural cuff, can be a safe and straightforward procedure with good clinical results.
Treatment of a Dural Arteriovenous Fistula of the Superior Sagittal Sinus by Neurosurgical Assisted Onyx Embolization

Keywords: dural arteriovenous fistula; onyx embolization; endovascular treatment

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A fifty-year-old patient was referred to our centre because of a single attack of non specific dizziness. There were no related symptoms. His medical history revealed migraine type headaches as an adolescent. MR imaging showed a vascular malformation in the right centroparietal region adjacent to the superior sagittal sinus, which was consistent with a Cognard type III dural arteriovenous fistula on classic angiography. A first embolization attempt failed, because of the toruous course of the middle meningeal artery; a transvenous route was deemed insufficient because of the aberrant course of the veins. A new embolization procedure was performed, with direct catheterization of the right middle meningeal artery through a strategically placed burr hole. The fistula was completely obliterated with Onyx and remains as such at follow-up angiography after one year. The patient experienced no complications.
Spinal dural arteriovenous fistulae: A consecutive series of 6 patients

Keywords: spinal dural arteriovenous fistula, spinal arteriovenous shunt, Intradural dorsal arteriovenous fistula

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Introduction. Spinal dural arteriovenous fistulae (SDAVF) are rare lesions in which an abnormal vascular shunt exists between a dural branch of a segmental spinal artery and a radicular vein that drains the perimedullary venous system. Optimal treatment of these lesions by surgery or embolization is still a matter of debate. We present the clinical characteristics of six consecutive patients and will discuss the treatment options in the light of the current literature.

Material and Methods. We retrospectively reviewed the medical charts of 6 consecutive patients diagnosed with a spinal dural arteriovenous fistula between 2002 and 2007. Clinical history, time to diagnosis, neurologic examination and imaging results were retrospectively collected.

Results. There were 3 male and 3 female patients with a mean age of 48 years. The mean time to diagnosis was 17 months. Mean follow-up was 33 months. Progressive paraparesis, sensory deficits and gait ataxia were present in 5 of 6 patients. Urinary incontinence was present in 4 patients at diagnosis. The mean Aminoff-Logue score pre- and postoperatively were 4.7 and 3.6 respectively. Five of six patients were treated by embolization and/or surgery. Two patients had embolization as the primary treatment option. Three patients were primarily operated. Complete obliteration was obtained in all treated patients. 3 patients required a second procedure. 4 of 5 patients were better or stable after treatment.

Conclusion. SDAVF will lead to significant morbidity if left untreated. If complete obliteration of the fistula cannot be achieved by embolization, direct surgery is recommended to avoid deterioration.
PEROPERATIVE NEUROPROTECTION DURING COMPLEX CEREBRAL ANEURYSM SURGERY, MONITORED BY COMBINED EEG MONITORING AND NEAR INFRARED SPECTROSCOPY

Keywords: Aneuvrysm, Neuroprotection, EEG, Near Infrared Spectroscopy

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We discuss the case of a 50-yrs old female pt with an asymptomatic (left) communicans anterior aneurysm. During surgery, EEG monitoring (unilateral frontal montage using bispectral EEG monitoring) was combined with near-infrared spectroscopy (NIRS : bilateral frontal regional cerebral saturation: rSO2). Surgical approach was made by supraciliary incision, enabling peroperative application of frontal non-invasive monitoring devices. During temporary clipping, barbiturates were titrated to a flat EEG (100% burst suppression), 1 MAC sevoflurane was added, 1000ml cold saline were infused, inspired oxygen was increased to 100% and strict control of blood pressure was assured. Final clipping of the aneurysm was achieved after 8 periods of temporary clipping (3.5min - 10.5min) resulting in a cumulative temporary clipping period of 43min. During this period, EEG BSR remained between 0 to 5% while rSO2 increased to 80-85%, without left to right differences. Control CT scan revealed no ischemic deficits, control angiography revealed complete obliteration of the aneurysm, with a slightly compromised perfusion of the right communicans anterior, without any sign of vasospasm. At 24hrs postoperatively, pt awakened, was extubated and revealed no clinical neurological deficit. At 72hrs postoperatively, pt was discharged from ICU.

This report illustrates the peroperative application (and monitoring) of neuroprotective measures in complex cerebral aneurysm surgery. Non-invasive neuromonitoring displaying simplified derived EEG parameters (BIS and SR) can be used to objectively guide maximal neuroprotection while NIRS monitoring can be used as an indicator of adequate bilateral cerebral oxygenation. In this pt, 43 min of temporary clipping of the communicans anterior artery were tolerated without any postoperative neurological deficit.
Surgery with control of the vertebral artery for tumoral processes: first two years experience.

Keywords: vertebral artery - cervical spine - craniocervical junction - tumors

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Introduction: Some tumors require the control of the vertebral artery (VA) due to their close relation with the artery. This analysis summarizes our first 2 years experience in this field.

Material and methods: 9 patients were operated on a lateral approach in our institution. Mean age was 49.4 years (25.0-69.9). Tumors included a chondroblastoma at C0, a giant cell tumor at C1, two metastasis at C2 and C3, two schwannomas at C4-C5 and C5-C6, a dumbell-shaped neurofibroma at C4-C5, a double-shaped MPNST at C3-C5, and a desmoid tumor at C3-C5.

Results: The VA was controlled in all cases. Mobilization of the VA was required in 4 cases. All targeted lesions were resected successfully. In the case of C3-C5 MPNST, it was decided preoperatively to leave a small remnant against a functional C5 nerve root. In the case of C2 vertebral body pathological fracture, the goal was to achieve medulla decompression. Five patients required complementary osteo-arthrodesis, due to the instability induced by the tumor (n=4) or previous posterior approach (n=1), and has consisted in posterior osteosynthesis (n=2) or antero-posterior osteo-arthrodesis (n=3). Postoperatively, all patients remained identical neurologically, or improved after medulla decompression. One patient required a transient tracheostomy for laryngeal edema. The patient with a C1 giant cell tumor developed a TIA due to VA dissection. This tumor recurred after 6 months and was re-operated. This patient is tumor-free after 12 months of follow-up. One patient with metastasis died of systemic failure after a survival of 1.5 years.

Conclusions: Surgery with VA control offers appropriate approaches to a large variety of tumors located at all levels of the cervical spine or craniocervical junction.
Effects of trains of high-frequency stimulation of the premotor/supplementary motor area on conditioned corticomotor responses in hemicerebellectomy

Keywords: hemicerebellectomy; high-frequency stimulation;

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Cortical network functions require both maintenance and fine tuning of the excitability of the motor cortex. The cerebellum is a key-player in the modulation of the excitability of the motor cortex. We wondered how trains of high frequency stimuli applied on the premotor/supplementary motor area influence the excitability of the ipsilateral motor cortex in a conditioning paradigm using peripheral stimulation. We investigated these effects in a model of acute hemicerebellectomy (left side) in rats (n = 10). Analysis of baseline corticomotor responses (before LFS/HFS) showed that peak-to-peak values were lower in the left gastrocnemius as compared to the right side (side effect: p = 0.007). Trains of stimulation (duration of pulses 600 μsec; inter-pulse interval: 1 msec) were applied in prefrontal region rFr2. Trains were repeated at a rate of 1 Hz (low frequency stimulation LFS) or 20 Hz (high frequency stimulation HFS) for a duration of 10 minutes. Test stimuli on motor cortex were preceded by a conditioning stimulus in contralateral sciatic nerve (inter-stimulus interval ISI of 5 msec or 45 msec). At ISI-5, conditioning increased intensities of MEPs in left motor cortex. This afferent facilitation was enhanced if preceded by trains of stimuli were administered over the ipsilateral rFr2 area. HFS had higher effects than LFS. The facilitation was lower for right motor cortex, for both LFS and HFS. At ISI-45, conditioned motor evoked responses were depressed as compared to unconditioned responses in left motor cortex (afferent inhibition). Following LFS, the degree of inhibition was unchanged while it increased with HFS. At baseline, inhibition was enhanced in right motor cortex. Interestingly, the afferent inhibition decreased significantly following HFS. We also assessed intra-cortical facilitation (ICF). The ICF was higher in left motor cortex than in right motor cortex at baseline, following LFS and following HFS (side effect: p < 0.001). Both LFS and HFS increased facilitation in both sides (frequency stimulation effect: p < 0.001, without left-right difference (side by frequency stimulation effect: p = 0.181). ICF was depressed in right motor cortex, but increased similarly on both sides following LFS/HFS. These results (1) confirm the increased inhibition in motor cortex contralaterally to the hemicerebellar ablation, (2) demonstrate that cerebellum is necessary for tuning amplitudes of corticomotor responses following a peripheral nerve stimulation, (3) suggest that for longer ISIs, HFS could have interesting properties for the modulation of afferent inhibition in case of extensive cerebellar lesion.
Objective:
The aim was to resect a large skull tumor and reconstruct the skull defect in a #one step# surgery using neuronavigated predefined resection of the lesion and direct reconstruction with a preoperatively customized skull prosthesis.

Material and methods:
A 12 year old patient presented with an progressively growing right parietal skull tumor. CT scan showed a skull lesion with intra and extracranial extension. The 3D CT scan data were used to reproduce a 3D stereolithographic epoxy resin model of the skull. The margins of tumor resection were determined on the epoxy resin model. A customised hydroxyapatite prosthesis reconstructing the resection zone was created. Preoperatively an image fusion of a CT scan of the resin model and a CT scan of the head of the patient with fiducials was performed. Intraoperatively the tumor was resected by neuronavigated guidance in order to obtain a perfect fitting between resection defect and customized prosthesis.

Results:
Intraoperatively the resection area corresponded exactly to the area we assumed to be involved by tumor which was diagnosed as an hemangioma. There was a perfect fitting of the customized prosthesis into de skull defect.

Conclusions:
The combination of the use of a customized skull prosthesis, image fusion and neuronavigation allowed a one step surgery with excellent esthetic result in a young patient presenting with a large cranial vault tumor.
INTRODUCTION: To report a casual relationship between Chiari I malformation and this rare, but recognized manifestation of bilateral papilledema, and clinical and morfological findings before and after surgery.

MATERIAL AND METHODS: An adult female patient of age 53 years presented with bilateral papilledema (II degree), sign of increased intracranial pressure and presumed pseudotumor cerebri. The cranial magnetic resonance imaging (MRI) revealed the evidence of a Chiari I malformation with tonsilar herniation at the level of foramen magnum.

RESULTS: The patient underwent suboccipital decompression, C1 laminectomy and duroplasty, following resolution of bilateral papilledema and signs of increased intracranial pressure.

CONCLUSION: Patient with bilateral papilledema and presumed pseudotumor cerebri require a cranial MRI to determine if they have a Chiari I malformation, because patient with increased intracranial pressure and papilledema from Chiari I malformation may benefit from suboccipital decompression.
The Arcuate Fasciculus: A Comparison between Diffusion Tensor Tractography and Anatomy Using the Fiber Dissection Technique

Keywords: arcuate fasciculus, fiber dissection technique, DTI tractography

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The Arcuate Fasciculus: A Comparison between Diffusion Tensor Tractography and Anatomy Using the Fiber Dissection Technique
de Jong L MD, Kovacs S, Bamps S, Van Calenbergh F MD, PhD, Sunaert S MD, PhD, van Loon J MD, PhD.

Objective: The arcuate fasciculus (AF) is a neural pathway connecting Broca#s area in the inferior frontal lobe and Wernicke#s area in the superior temporal lobe and the temporo-parietal junction. Asymmetry in AF volume and density between the dominant and non-dominant hemisphere has been demonstrated in diffusion tensor imaging (DTI) studies. The objective of this study is to anatomically confirm this asymmetry using the fiber dissection technique.

Methods: In eight brain specimens obtained at routine autopsy both the left and right AF were identified, using Klingler#s fiber dissection technique, after preparation by fixation and freezing. Following decortication, progressive white matter dissection was performed using the operative microscope. When the AF was exposed, a coronal section was performed at a predetermined point one centimetre anterior of its posterior curve, enabling a measurement of its sectioned surface. DTI data was acquired for eight patients suffering from pathologies that did not interfere with the AF. For each patient both the left and right AF were reconstructed using DTI tractography.

Results: Comparison of the mean surface of the sectioned AF in the right hemispheres (59mm² ± 12) and left hemispheres (95 mm² ± 21) of the dissected brain specimens revealed a significant difference (p<0.05). With DTI similar results were obtained when comparing the reconstructed AF in both hemispheres: a significant difference in AF volume and density was demonstrated in favour of the dominant hemisphere.

Conclusion: In this study we demonstrated a significant asymmetry between the left and right arcuate fasciculi both using diffusion tensor tractography and the Klingler#s fiber dissection technique.

Keywords: arcuate fasciculus, fiber dissection technique, DTI tractography
Meningeal Enhancement in Shunt Related Intracranial Hypotension

Keywords: intracranial hypotension; meningeal enhancement; magnetic resonance imaging; shunt

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Meningeal enhancement is described in multiple pathologies, amongst which intracranial hypotension, spontaneous or shunt-related. However, a significant number of patients with proven overdrainage and related symptoms will show no meningeal enhancement on MR imaging. Conversely, there are reports of asymptomatic patients with obvious shunt-related overdrainage and meningeal enhancement.

Two cases are presented with typical symptomatology and with proven chronic shunt-related overdrainage, one with and one without meningeal enhancement. After adequate treatment, in both patients the symptoms were resolved and enhancement on MR imaging disappeared in the one patient.

The radiological findings, pathophysiology and significance of gadolinium meningeal enhancement in shunt-related intracranial hypotension are debated.